intersil

December 1, 2000

Magalie Roman Salas, Esq.
Secretary
Federal Communications Commission
445 Twelve Street, S.W., Room TWB204
Washington, D.C. 20554

Re: Intersil Corporation
***Ex Parte* Communication**
Amendment of Part 15 of the Commission's Rules Regarding Spread Spectrum Devices, ET Docket No. 99-231

Dear Ms. Salas:

Intersil Corporation ("Intersil"), pursuant to Section 1.1206 of the Commission's Rules, is writing to report a written *ex parte* submission to the Commission regarding the above-referenced matter. Attached is a copy of Intersil's reply comments (submitted pursuant to the FCC's public notice, DA 00-2317) concerning Wi-LAN's application for review. Because Intersil has alluded to its position on the Commission's review of the CW jamming margin test in the above-referenced docket, Intersil submits this *ex parte* notice out of an abundance of caution.

Please date-stamp the extra copy of this letter and return it in the enclosed envelope. If you have any questions regarding this filing, please contact James Zyren at (407) 729-4177.

Very truly yours,

Larry Ciaccia
Vice President, Engineering
Intersil Corporation
2401 Palm Bay Road
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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	**DA 00-2317**
Wi-LAN, Inc.	)	
	)	
Application for Certification of an	)	
Intentional Radiator under Part 15 of the	)	
Commission's Rules, FCC ID K4BAP01	)	
	)	
Application for Review	)	

Reply Comments of Intersil Corporation

1.0 Introduction

Intersil favors industry initiatives to increase data rates for systems operating in the 2.4 GHz ISM band, provided that the potential for harmful interference to other users of the spectrum can be limited. The advent of broadband data services *to* the home in the form of cable and DSL modems has created the demand for high rate wireless systems capable of distributing data *within* the home. In particular, Orthogonal Frequency Division Multiplexing (OFDM) is an outstanding technology which is capable of reliably and cost effectively delivering high data rates in very challenging radio frequency (RF) environments. This and other broadband technologies should be made available for use in the 2.4 GHz ISM band.

As pointed out by the Office of Engineering and Technology (OET),[1] the desire to provide higher data rates must be balanced with the necessity of limiting the potential for harmful interference for other users of the spectrum. The spread spectrum rules were intended to minimize the potential for harmful interference to other users by spreading the RF energy in the transmitted signal via means of frequency hopping or direct sequence modulation.

Based on the desire to provide higher data rates to consumers, Intersil is supportive of Wi-LAN's efforts to obtain equipment authorization for the operation OFDM-based radios in the

2.4 GHz ISM band. However, should the Commission determine that OFDM and other technologies capable of delivering higher data rates and greater spectral efficiency cannot be authorized under the current rules, Intersil would ask the Commission to consider adopting an alternative set of regulations for digitally modulated equipment which would permit the use of such technologies in the 2.4 GHz ISM band. The competing needs for higher data rates and the necessity of limiting the potential for harmful interference to other users of the spectrum can be balanced. By creating an alternative set of rules for a general class of digitally modulated equipment that operates with a suitable power limit and a specified maximum power spectral density (PSD), both requirements can be satisfied. Further, similar rules are already in place in the 5 GHz Unlicensed National Information Infrastructure (UNII) bands.

Clear, unambiguous compliance testing procedures are already defined for the UNII bands. Adoption of similar rules will provide equipment manufacturers with simple, easily understood rules while encouraging the development of a new generation of digitally modulated radios for use in the 2.4 GHz ISM band.

2.0 Discussion of Wi-LAN's Petition for Review

Within the Application for Review, Wi-LAN pointed out that the equipment for which they are seeking authorization passes the test for Direct Sequence Spread Spectrum (DSSS) processing gain as defined in Section 15.247(e)(2) of the Commission's Rules. In denying authorization, OET countered that passage of the test by and of itself does not guarantee that the equipment in question complies with the rules for spread spectrum equipment. In this instance, OET denied equipment authorization for three reasons:

1. The equipment tested does not meet the definition of a spread spectrum device due to the spectral efficiency of the OFDM signal.
2. An OFDM system does not meet the definition of a DSSS system because it does not employ a classic correlator structure to collapse the spectrum of the received signal.
3. OFDM systems use multiple carriers as compared to a single carrier.

[1] Letter from Dale Hatfield (Chief of OET) to Mitchell Lazarus (Wi-LAN counsel) (August 18, 2000).

Each of the three rejection criteria is discussed below.

2.1 Spectral Efficiency

In Section 2.1(c) of the Commission's Rules, 47 C.F.R § 2.1(c), a *DSSS* system is defined as:

> *A spread spectrum system in which the carrier has been modulated by a high speed spreading code and an information data stream. The high speed spreading code sequence dominates the 'modulating function' and is the direct cause of the widening of the transmitted signal.*

Also in Section 2.1(c) of the Commission's Rules, 47 C.F.R. § 2.1(c), a *spread spectrum system* is defined as:

> *A spread spectrum system is an information bearing communications system in which: (1) Information is conveyed by modulation of a carrier by some conventional means, (2) the bandwidth is deliberately widened by means of a spreading function over that which would be needed to transmit the information alone. (In some spread spectrum systems, a portion of the information being conveyed by the system may be contained in the spreading function.)*

These definitions do imply spectral inefficiency. However, the degree of spectral inefficiency is not quantified. Further, neither the current CW jamming margin test, nor the Gaussian noise test (proposed in the Notice of Proposed Rulemaking in ET Docket 99-231), will alone provide a clear distinction between those systems that meet the Commission's requirements for DSSS devices and those systems which do not. As a result, the Commission has been placed in the uncomfortable position of determining whether or not equipment is in compliance without benefit of a decisive test.

2.2 Use of Correlators

Another factor cited by OET in the denial of equipment authorization for Wi-LAN's radios was based on the fact that DSSS radios employ classic correlator structures to collapse the received signal.[2] In its Petition for Reconsideration,[3] Wi-LAN stated that CCK systems do not use classic correlators. Intersil wishes to make a clarification. Intersil's products employ a set of fixed PN sequences to spread the signal at the transmitter. Some of the information is conveyed in the spreading function, as explicitly permitted by the Commission's definition of spread spectrum systems. The signal is correlated with the same set of fixed PN sequences at the receiver in the demodulation process. To improve efficiency, a transform is used in the receiver to implement the correlator.

2.3 Single Carrier vs. Multi-Carrier Systems

OET also mentions the use of multiple carriers as a basis for denial of Wi-LAN's application for equipment authorization. Even though OFDM systems use multiple subcarriers, the resulting transmitted spectrum is contiguous like that of a single carrier system. Consider the simple example of a system that transmits information via BPSK modulation using 11 orthogonal subcarriers, with each subcarrier transmitting at 1 Mbps. As shown in Figure 2.3-1, the transmitted OFDM signal is a composite of the individual subcarriers. Further, the composite OFDM signal, like that of a single carrier system, is contiguous. In this regard, there is no fundamental difference between OFDM and single carrier systems.

[2] Letter from Joe Dichoso (Equipment Authorization Branch, OET) to Eric Godberson (Wi-LAN) (May 12, 2000).
[3] Wi-LAN, Petition for Reconsideration and Alternative Request for Waiver (May 26, 2000) at 2.

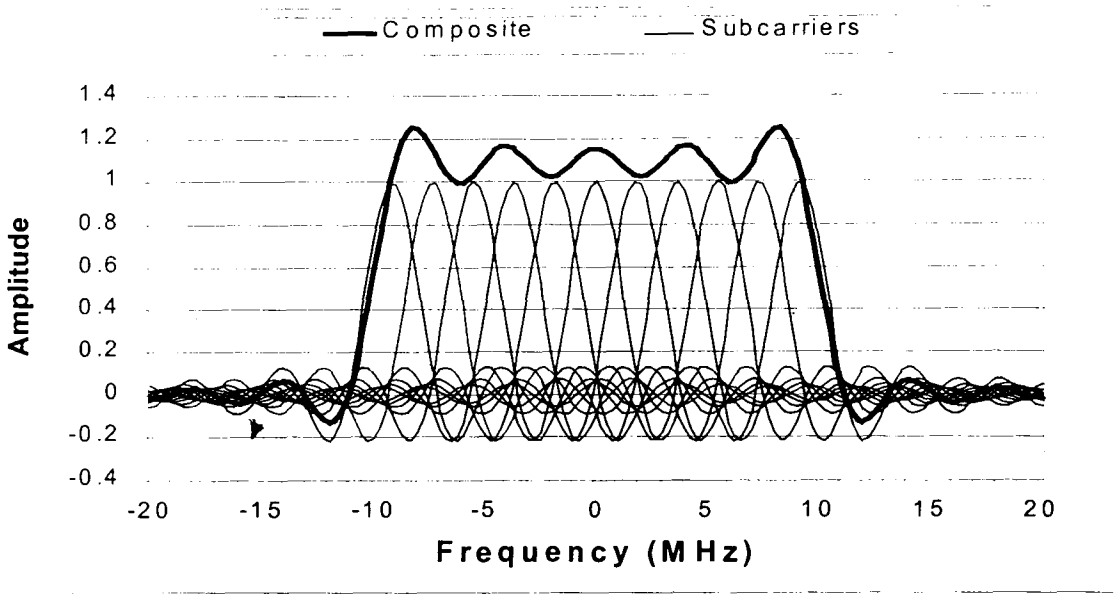

Figure 2.3-1 OFDM Composite Signal is Contiguous

3.0 Compliance Testing for Direct Sequence Spread Spectrum Equipment

As mentioned above, the current test for compliance with the Commission's requirements for DSSS devices is the subject of an on-going rule making proceeding (ET Docket 99-231). During the course of that proceeding, the Commission received numerous comments regarding the merits of the current DSSS Continuous Wave (CW) Jamming Margin test and the proposed alternative method based on the use of a Gaussian interference source. We salute the Commission's efforts to develop a test that is both easier to implement and that will result in a clear and unambiguous measure of system processing gain.

In spite of the Commission's efforts, the record indicates that there is a considerable diversity of opinion within the industry in regard to the precise definition of processing gain. It is therefore difficult, if not impossible, to develop a meaningful and unambiguous test intended to measure a parameter which is not universally understood by all segments of industry to have the same precise meaning. While a Gaussian noise test may well prove to be easier to implement,[4] it will likely be no more effective than the current test in terms of providing a clear

[4] Comments of Aironet Wireless Communications, Inc., filed October 4, 1999, in ET Docket 99-231.

distinction between those systems meeting the Commission's requirement for 10 dB of processing gain and those which do not.

This situation causes considerable difficulty, both for equipment manufacturers and members of the Commission's staff responsible for equipment authorization. The Wi-LAN example shows that manufacturers cannot know for certain whether any given system complies with the Commission's Rules until the equipment is actually submitted for authorization. By the same token, regulators are faced with making a difficult determination as to whether a given system does, or does not meet the definition of a DSSS device. A clear and unambiguous alternative set of rules for digitally modulated equipment operating in the 2.4 GHz ISM band will benefit consumers, industry, and regulators.

Further, an alternative set of rules would have the following practical effects:

1.) Manufacturers could develop new equipment capable of operating at much higher data rates to serve both business and consumers.
2.) Manufacturers would have a simple, unambiguous set of rules.
3.) Equipment authorization testing would be much easier to perform, and much easier to review by the Commission. The need for receiver testing could be eliminated.
4.) The resulting rules would be very similar to current ETSI requirements for DSSS systems (ETS 300 328) and FCC rules for UNII band equipment. These rules have proven to be easily understood by industry and easily verified by regulators.

4.0 Conclusions

Adoption of simple and unambiguous rules for digitally modulated radios operating in the 2.4 GHz ISM band would resolve a number of issues. Such rules would enable a new generation of high speed networking products suitable for the increasing demand for ubiquitous bandwidth in homes, classrooms, and businesses. Suitable power and PSD limits would ensure that other users of the spectrum do not suffer harmful interference. To address concerns of both regulators

and industry, every effort should be made to consider the adoption of an alternative set of rules for a general class digitally modulated devices in a timely manner.

Respectfully submitted,

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